

We claim:

1. A process for removing
a compound which bears at least two functional groups which are each inde-
pendently selected from the group consisting of nitrile group, carboxylic acid
group, carboxylic ester group and carboxamide group,
from a mixture which comprises
a compound which bears at least two functional groups which are each inde-
pendently selected from the group consisting of nitrile group, carboxylic acid
group, carboxylic ester group and carboxamide group, and
a compound which is homogeneous with respect to the mixture and contains
rhodium, by distillation.
2. A process as claimed in claim 1, wherein the distillation is carried out at a tem-
perature in the range from 50 to 200°C.
3. A process as claimed in either of claims 1 and 2, wherein the distillation is carried
out at an average mean residence time in the range from 1 to 45 minutes.
4. A process as claimed in any of claims 1 to 3, wherein the compound used which
bears at least two functional groups which are each independently selected from
the group consisting of nitrile group, carboxylic acid group, carboxylic ester group
and carboxamide group is a monoolefinically unsaturated compound.
5. A process as claimed in claim 4, wherein the monoolefinically unsaturated com-
pound used is a compound which is obtainable by dimerizing two terminal olefins
which bear the functional groups required to prepare the monoolefinically unsatu-
rated compound containing at least two functional groups.
6. A process as claimed in claim 5, wherein the terminal olefins used are two olefins
which each independently have the formula $H_2C=CHR$ in which R is a nitrile
group, carboxylic acid group, carboxylic ester group or carboxamide group.
7. A process as claimed in either of claims 5 or 6, wherein the dimerization is car-
ried out in the presence of a compound, as a catalyst, which is homogeneous
with respect to the reaction mixture and contains rhodium, ruthenium, palladium
or nickel.
8. A process as claimed in either of claims 5 or 6, wherein the dimerization is car-
ried out in the presence of a compound, as a catalyst, which is homogeneous
with respect to the reaction mixture and contains rhodium.

9. A process as claimed in any of claims 1 to 8, wherein the monoolefinically unsaturated compound used which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is hexenedioic diester.
10. A process as claimed in any of claims 1 to 8, wherein the monoolefinically unsaturated compound used which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is butenedinitrile.
11. A process as claimed in any of claims 1 to 8, wherein the monoolefinically unsaturated compound used which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is 5-cyanopentenoic ester.
12. A process as claimed in any of claims 1 to 3, wherein the compound used which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is a saturated compound.
13. A process as claimed in claim 12, wherein a saturated compound is used which is obtainable by hydrogenating a monoolefinically unsaturated compound which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group, carboxamide group, obtainable by a process as claimed in any of claims 4-11.
14. A process as claimed in claim 13, wherein the hydrogenation is carried out in the presence of a compound, as a catalyst, which is homogeneous with respect to the reaction mixture and contains rhodium, ruthenium, palladium or nickel.
15. A process as claimed in claim 13, wherein the hydrogenation is carried out in the presence of a compound, as a catalyst, which is homogeneous with respect to the reaction mixture and contains rhodium.
16. A process as claimed in any of claims 12 to 15, wherein the saturated compound used which bears at least two functional groups which are each independently

selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is adipic diester.

- 5 17. A process as claimed in any of claims 12 to 15, wherein the saturated compound used which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is adipodinitrile.
- 10 18. A process as claimed in any of claims 12 to 15, wherein the saturated compound used which bears at least two functional groups which are each independently selected from the group consisting of nitrile group, carboxylic acid group, carboxylic ester group and carboxamide group is 5-cyanovaleric ester.
- 15 19. A process as claimed in either of claims 8 and 15, wherein the same rhodium-containing compound is used as a catalyst in the hydrogenation and the dimerization.
- 20 20. A process as claimed in any of claims 1 to 19, wherein the rhodium-containing compound used which is homogeneous with respect to the mixture is of the formula $[L^1RhL^2L^3R]^+X^-$ where
 - L^1 is an anionic pentahapto ligand;
 - L^2 is an uncharged 2-electron donor;
 - L^3 is an uncharged 2-electron donor;
 - 25 R is selected from the group consisting of H, C_1 - C_{10} -alkyl, C_6 - C_{10} -aryl and C_7 - C_{10} -aralkyl ligands;
 - X^- is a noncoordinating anion;

and where two or three of L^2 , L^3 and R are optionally joined.
- 30 21. A process as claimed in claim 20, wherein L^1 is pentamethylcyclopentadienyl.
- 35 22. A process as claimed in either of claims 20 and 21, wherein X^- is selected from the group consisting of BF_4^- , $B(\text{perfluorophenyl})_4^-$, $B(3,5\text{-bis(trifluoromethyl)phenyl})_4^-$ and $Al(OR^F)_4^-$, where R^F is identical or different part-fluorinated or perfluorinated aliphatic or aromatic radicals, in particular perfluoroisopropyl or perfluoro-tert-butyl.

23. A process as claimed in any of claims 20 to 22, wherein L^2 and L^3 are each independently selected from the group consisting of C_2H_4 , $CH_2=CHCO_2Me$, $P(OMe)_3$ and $MeO_2C-(C_4H_6)-CO_2Me$.
- 5 24. A process as claimed in any of claims 20 to 22, wherein L^2 and L^3 together are selected from the group consisting of acrylonitrile and 5-cyanopentenoic ester.
25. A process as claimed in any of claims 20 to 23, wherein L^2 and R together are $-CH_2-CH_2CO_2Me$.
- 10 26. A process as claimed in any of claims 20 to 23 or 25, wherein L^2 , L^3 and R together are $MeO_2C(CH_2)_2-(CH-)-(CH_2)CO_2Me$.
- 15 27. A process as claimed in any of claims 20 to 26, wherein the rhodium-containing compound which is homogeneous with respect to the mixture is selected from the group consisting of
- 20 $[Cp^*Rh(C_2H_4)_2H]^+ BF_4^-$,
 $[Cp^*Rh(P(OMe)_3)(CH_2=CHCO_2Me)(Me)]^+ BF_4^-$,
 $[Cp^*Rh(-CH_2-CH_2CO_2Me)(P(OMe)_3)]^+ BF_4^-$,
 $[Cp^*Rh(MeO_2C(CH_2)_2-(CH-)-(CH_2)CO_2Me)]^+ BF_4^-$,
 $[Cp^*Rh(C_2H_4)_2H]^+ B(3,5-bis(trifluoromethyl)phenyl)_4^-$,
 $[Cp^*Rh(P(OMe)_3)(CH_2=CHCO_2Me)(Me)]^+ B(3,5-bis(trifluoromethyl)phenyl)_4^-$,
 $[Cp^*Rh(-CH_2-CH_2CO_2Me)(P(OMe)_3)]^+ B(3,5-bis(trifluoromethyl)phenyl)_4^-$,
25 $[Cp^*Rh(MeO_2C(CH_2)_2-(CH-)-(CH_2)CO_2Me)]^+ B(3,5-bis(trifluoromethyl)phenyl)_4^-$,
 $[Cp^*Rh(C_2H_4)_2H]^+ B(perfluorophenyl)_4^-$,
 $[Cp^*Rh(P(OMe)_3)(CH_2=CHCO_2Me)(Me)]^+ B(perfluorophenyl)_4^-$,
 $[Cp^*Rh(-CH_2-CH_2CO_2Me)(P(OMe)_3)]^+ B(perfluorophenyl)_4^-$,
 $[Cp^*Rh(MeO_2C(CH_2)_2-(CH-)-(CH_2)CO_2Me)]^+ B(perfluorophenyl)_4^-$,
30 $[Cp^*Rh(C_2H_4)_2H]^+ Al(OR^F)_4^-$,
 $[Cp^*Rh(P(OMe)_3)(CH_2=CHCO_2Me)(Me)]^+ Al(OR^F)_4^-$,
 $[Cp^*Rh(-CH_2-CH_2CO_2Me)(P(OMe)_3)]^+ Al(OR^F)_4^-$,
 $[Cp^*Rh(MeO_2C(CH_2)_2-(CH-)-(CH_2)CO_2Me)]^+ Al(OR^F)_4^-$,
- where R^F is identical or different part-fluorinated or perfluorinated aliphatic or aromatic radicals, in particular perfluoroisopropyl or perfluoro-tert-butyl.
- 35 28. A process as claimed in any of claims 1 to 27, wherein the distillation is carried out at a pressure in the range from 0.05 to 50 kPa.